REMARKS

RESPONSE

Reconsideration and allowance are respectfully requested. Upon entry of this amendment, claims 1-61 will remain pending.

Claims 1-61 stand rejected under 35 USC 112, second paragraph, as being indefinite. Applicant has made nonsubstantive amendments (primarily changing "the" to "a" in instances where the feature was inherent). In view of the amendments, the claims are believed definite and readily understandable.

Claims 1-61 stand rejected under 35 USC 103 as being obvious over Gurney '377 in view of Gurney '617 and Smith '508. Applicant respectfully disagrees.

Each of the independent claims, and the claims dependent thereon, are directed to an apparatus or method that senses pressure. Independent apparatus claim 1 recites a sensor disposed on a support structure, with the sensor including a ferromagnetic biasing layer, a nonmagnetic conducting layer, and a magnetoresistive layer that has non-zero magnetostriction that will change upon the application of pressure. Independent claim 21 recites an array of such sensors. Independent method claim 41 recites providing a sensor that has a nonmagnetic conducting layer between a ferromagnetic biasing layer and a magnetoresistive layer that has non-zero magnetostriction, and then sensing a resistance upon application of pressure. Claim 41 is directed to a mangetoresistive sensor that is formed on a support structure, with the support structure being above the cavity that exists over the substrate.

later filed Gurney '617 patent that teaches a strain gauge was invented by the same inventor Gurney of the Gurney '377 patent, but the '377 patent is not cited as a reference to the '617 patent. Rather, the attempted combination most likely results from inappropriate use of hindsight, having gained the knowledge from the applicants' invention.

A still further indication that a combination of these references is inappropriate is that the function of sensing magnetic filed in each of Gurney '337 and Smith '508 would necessarily be destroyed if modified to sense pressure.

And even further, there is no teaching in any of the references, including Gurney '617, that teaches how to obtain a sensor with the recited layers to sense pressure. For example, which layer should have non-zero magnetostriction in order to sense pressure is not mentioned. In fact, contrary teachings exist, since magnetic field sensor, as in the Gurney '377 patent, typically operate with zero magnetostriction.

Accordingly, for the above reasons, applicants' submit that each of independent claims 1, 21, and 41, and the claims dependent thereon, contain allowable subject matter.

Furthermore, the specific structure of the pressure sensor recited in claim 47, as well as the further structure recited with a plurality of sensor in dependent claim 56, are not taught or suggested in any of the cited references. In particular, the arrangement of a substrate, with a cavity in the substrate and the support structure that holds the pressure sensor thereon is not disclosed or suggested in any of the cited references.

Each of independent claims 1, 21, and 41 therefore recite an apparatus or method of using a magnetoresistive sensor that contains the recited biasing, nonmagnetic conducting, and magnetoresistive layers that has non-zero magnetostriction in order to sense pressure.

In contrast, and contrary to the Examiner's assertion, Gurney '377 is not directed to a magnetoresistive sensor that can sense pressure. Rather, Gurney '377 is directed to a conventional magnetoresistive sensor that sense magnetic field. For example, in the "Technical Field" discussion at column 1, lines 1-3, the Gurney '377 invention is sated as relating "generally ...to MR sensors .... for sensing magnetic fields." Similarly, Smith '508 is directed to an invention that senses magnetic fields, as described, for example, in the Abstract of the Invention. Thus, applicants respectfully assert that the Examiner's reliance on either of Gurney '377 or Smith '508 is misplaced.

And while Gurney '617 is directed to a strain gauge that is fabricated using a GMR sensor, much different than the sensor recited by claims 1, 21, and 41, with the layers, as recited, forming an MR sensor. Further claim 21 recites a plurality of such sensors disposed in an array, whereas Gurney '617 neither teaches nor suggests forming an array of sensors that can each sense pressure.

Furthermore, while applicants assert that Gurney '377 and Smith '508 are not relevant, if the Examiner maintains a contrary position, Applicant's furthermore respectfully assert that one of ordinary skill in the art would not have been motivated to combine these references. In particular, since Gurney '377 and Smith '508 are directed to sensing magnetic field, they are not directed to sensing pressure. A further indication that these references are not related is that the

Accordingly, applicants' submit that independent claim 47, dependent claim 56, and the other dependent claims contain allowable subject matter.

In view of the above, applicants submit that the above-referenced application is in a condition for allowance and such a Notice is respectfully requested.

Respectfully submitted,

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I certify that the enclosed papers and fee are being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231, on October 19, 2001

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Margaret M. Hasson

APPENDIX
Amended claims showing changes

The following claims 1, 7, 17, 21, 27, 37, 41, 42 and 45 have been amended as follows:

1. (Amended) An apparatus capable of sensing pressure comprising:

a support structure; and

a sensor disposed on the support structure, the sensor including:

a ferromagnetic biasing layer;

a nonmagnetic conducting layer disposed on the ferromagnetic biasing layer; and

a magnetoresistive layer, wherein the magnetoresistive layer has non-zero magnetostriction such that [the] a resistance of the magnetoresistive layer will change upon the application of pressure.

7. (Amended) An apparatus according to claim 6 wherein [the] a width of the beam ranges from 1 microns to several microns.

17. (Amended) An apparatus according to claim 1 wherein [the] a thickness of each of the ferromagnetic biasing layer, the nonmagnetic conductive layer and the magnetoresistive layer are within the range of 0.001μm – 0.5 μm.

21. (Amended) An apparatus capable of sensing pressure comprising:

a substrate; and

a plurality of sensor devices disposed on the substrate in an array, each of the sensor devices including:

a support structure; and

a sensor disposed on the support structure, the sensor including:

a ferromagnetic biasing layer;

a nonmagnetic conducting layer disposed on the ferromagnetic biasing layer; and

a magnetoresistive layer, wherein the magnetoresistive layer has non-zero magnetostriction such that [the] a resistance of the magnetoresistive layer will change upon the application of pressure.

27. (Amended) An apparatus according to claim 26 wherein [the] a width of each of the beams ranges from 1 microns to several microns.

37. (Amended) An apparatus according to claim 21 wherein [the] a thickness of each ferromagnetic biasing layer, each nonmagnetic conductive layer and each the magnetoresistive layer is within the range of 0.001 micron – 5 micron.

41. (Amended) A method of sensing pressure in which applied pressure causes a change in [the] a magnetization vector of a magnetoresistive layer within [the] a device and a corresponding change in resistance comprising the steps of:

providing a sensing device with a sensor including plurality of layers, the plurality of layers comprising a non magnetic conducting layer disposed between a magnetoresistive layer with non-zero magnetostriction and a ferromagnetic biasing layer; and

sensing a resistance in the plurality of layers upon application of pressure to the sensing device, the applied pressure causing the magnetization vector of the magnetoresistive layer to change and thereby result in a change in resistance.

42. (Amended) A method according to claim 41 wherein the sensing device includes a plurality of sensors that are formed and operate as the one sensor such that during the step of sensing each sensor detects the pressure of an area associated with that sensor.

45. (Amended) A method according to claim 44 wherein the sensing device includes a plurality of sensors that are each formed and operate as the one sensor such that during the step of sensing each sensor detects the pressure of an area associated with that sensor.